

SECRET

INFORMATION REPORT

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NO. OF PAGES 25X1A

NO. OF ENCLS.
(LISTED BELOW)

SUPPLEMENT TO
REPORT NO.

25X1X

- ### a. Hardness and Density

ØW0207

ØNO709

1413 V.P.N. 1/
14.80 grms/cc.

1505 V.P.N. 1/
11.21 grms/cc.

b. Analysis

ØWO207

ØNO709

Total carbon	5.59%	7.53%
Free carbon	Trace	
Titanium	0.12%	.008%
Cobalt	7.22%	11.84%
Iron	1.14%	6.06%
		1.17%

c. Microstructure

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- (1) The reason for this structural defect is not clear, but it appears from the shape of the crystals of tungsten carbide within the coarse grained areas, that these grains existed substantially in the same form prior to sintering; their presence is not due to grain growth during sintering.
- (2) This effect probably could be obtained if crushed sintered carbide scrap was incorporated in the powder before sintering, as is the practice of one Austrian Company (Edelstahlwerke of Reutte). It would be difficult to crush sintered scrap to a fine grain-size, and would result in coarse areas, as is exhibited by this sample.
- (3) Considering the fairly high titanium carbide content of specimen ØNO709, the material is reasonably free from porosity.
- (4) The microstructure showed a very coarse grain-size and the amount of free tungsten carbide was very high; it would appear that the titanium carbide has been added as such without forming, as is more usual, a mixed crystal of the titanium and tungsten carbides. In consequence, the structure is far less homogeneous than would be found in good quality hard metal.

2. Conclusions

- a. Both tips are of fair quality, and the carbon content in each closely approaches theoretical, but the hardness figures are rather lower than would be expected for such compositions; the densities are satisfactory.
- b. The presence of more than one per cent of iron, while not influencing the structure or hardness to a great extent, would tend to affect strength and the tips would probably be inclined to be rather brittle.
- c. On the average, the material is much coarser than WILMET (tradename for Edelstahlwerke products) and this would explain the low hardness figures; the composite material would therefore be less wear-resistant than the corresponding WILMET grades.
- d. Both Soviet tips contain larger crystals of tungsten carbide than a similar American product, which contains small and completely homogeneous crystal structure.
 - (1) Large crystals tend to pick out in use, causing the tip to crater.
- e. The Soviet tips show greater porosity than similar American products.
 - (1) Excessive porosity with inferior crystal structure results in a tip with non-uniform hardness.

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